JAROSITE FROM MOUNT GÉCSI

(The Mountain Range of Velence)

BY J. ERDÉLYI AND V. TOLNAI

The Board of Directors of the Hungarian Geological Institute expressed in 1952 the wish that we should examine the yellow coloured unknown mineral samples originating from the collection of B. Jantsky. The mineral samples were found at the investigations carried out in the Mountain Ranges of Velence at Mount Gécsi. The results of the investigation are as follows:

The granite mother rocks contained radial crystal prints. These »radial minerals« are the prints of some primary mineral, the walls of these prints are coated with yellow coloured glittering small crystals 1—2 tenth of a mm in size, or even still smaller, obviously they are perimorphs. At the first glance these glittering crystals seem to be a combination of hexahedrons and tetrahedrons. Their hardness is very slight: 2—3. They dissolve in warm HCl. The solution contains considerable amounts of iron and sulphate. If the mineral granule is moistened with HCl it shows a bright sodium- and potassium flame reaction. When heated in a test tube it gives off water. On heating in a closed test tube with Mg splitters till it shows a thin metallic As mirror and sulphur sublimation forms. This indicates that it is potassium-sodium-iron sulphate containing water.

The very small dimensions of the minute crystals render angular measurements with instruments very difficult. However, we after all succeeded in measuring the angle of inclination of the would be hexahedron and tetrahedron planes on a small crystal: it was 55°.

According to the so far gathered data it seemed likely that the mineral is jarosite the chemical composition of which is $KFe_3(SO_4)_2 \cdot (OH)_6$. The crystal shape of jarosite is a combination of a rhombohedron approaching closely a hexahedron and that of the basal plane. The angle of the rhombohedron is 90° 45′. The angle of inclination of the basal plane and the rhombohedron plane is:

$$c(0001) : r(10\bar{1}1) = 55^\circ\ 15'$$

These data are in good agreement with our observations and the angle measurements mentioned previously. The hardness, lustre and colour of the jarosite also corresponds with the above data.

To obtain definite data the chemical laboratory of the Geological Institute analysed the mineral chemically. The analyses were made by V. Tolnai and Mrs. Földváry. The results of the analyses were published in a letter by the Board of Directors of the Geological Institute on January 28, 1953. The data of the analyses are as follows:

Insoluble in HCl	27.44 %
— H_2O	0.39
+ H_2O	7.93
Fe_2O_3	31.69
Al_2O_3	3.98
SO_3	22.45
K_2O	5.46
Na_2O	1.07
	100.40 %

The examination of the part wich is insoluble in HCl:

SiO_2	76.56 %
Al_2O_3	14.70
Fe_2O_3	0.93
TiO_2	traces
CaO	0.61
MgO	1.28

Spectroscopical investigation:

Main mass: Fe, Na, K, Al, Si.

Pronounced traces: As

traces: Pb

Very slight traces: Ag

From the point of view of the mineral examination the data relating to the part insoluble in HCl are the decisive ones. Therefore, by increasing the analytical data of the part is soluble in HCl with 27.44 per cent which corresponds to the insoluble part, the analytical data were supplemented to 100.40 per cent. After the recalculation the analytical data are as follows:

H_2O (entire water)	11.45 %
Fe_2O_3	43.61
Al_2O_3	5.48
SO_3	30.89
K_2O	7.51
Na_2O	1.47
	100.41 %

The corresponding molecule quotients are:

H_2O	0.63557	$\sim$	6
Fe_2O_3	0.27311	0.32673$\sim$3	
Al_2O_3	0.05362		
SO_3	0.38579	$\sim$	4
K_2O	0.07972	0.10889=1	
Na_2O	0.02917		

Considering that Al can substitute the Fe and sodium the potassium the mol-quotients of Al and Fe and those of potassium and sodium were summated. Hence the formula of the mineral is:

$$K_2O \cdot 3Fe_2O_3 \cdot 4SO_3 \cdot 6H_2O = KFe_3(SO_4)_2(OH)_6,$$

which corresponds exactly with the chemical composition of jarosite. Considering that sodium jarosite, argentojarosite and plumbojarosite are well known minerals and that Al often substitues Fe in jarosite, furthermore that in the case of complete substitution the chemical composition of alunite is obtained: $KAl_3(SO_4)_2(OH)_6$, the minerals found in Mount Gécsi can be considered to be a mixture of the above minerals. The mineral mixture resembling the latter which also mostly contains carphosiderite (cyprusite) occurring usually in earthy aggregates as incrustations, is termed by the miners »yellow iron ore« or »misy«. The data of the analysis have revealed that as regards the examination of the mineral the part which is insoluble in HCl is of no importence. The main bulk of this insoluble part is aluminum silicate an impurity originating from the silicate of the granite rocks which mingled with the substance under investigations as the jarosite was scraped off from the mother rocks. However, if they are dissolved in HCl the two substances can be completely separated.

Jarosite is a secondary mineral forming at the decomposition of sulphide iron ores in a dry atmosphere. It is the characteristic mineral of »iron hat«. Limonite is another decomposition product which can be found in small globules associated with the jarosite of Mount Gécsi. Considering that alunite occurs at many places in the Mountain Range of Velence as a result of the action of »solfatara« the presence of alunite associated with jarosite is not surprising.

The primary sulphide minerals were most probably radial marcasite and in the main bulk radial arsenopyrite this assumption is confirmed by the As impurity contained in them. This also explains the radial mineral prints on the walls of wich the small jarosite crystals are deposited. The Ag and Pb traces are probably due to the impurities contained in the primary ore, or in its associated minerals.

National Museum for Natural Sciences, Min. Dept. Budapest.